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April 18, 1980

ARNOLD, WHITE & DURKEE, ESQS.
ATTORNEYS AT LAW
2100 Transco Tower
Houston, Texas 77056

Attention: Wayne M. Harding,Esq.

Re: BALLY V GOTTLIEB, No. 78G 2246, Our File No. 12685 WW/WW.

Dear Mr. Harding:

Keith Edward Winter has now read his deposition, taken March 6, 1980, in the above matter, requesting the following changes or corrections:

Page	Line	Change or correction
7	18	Delete "a" between "design" and "one"
7	22&24	Strike the word "kit"
7	28	" " words "code and"
13	27	Change "the pace of 16" to "the Pace 16"
16	20	" "Sheet" to "Switch"
19	22	" "174CPU" to "174 and CPU"
20	3	" "handed" to "ANDed"
20	13	" "Nos. 597" to "Nos. 5,9,7"
20	14	" "No. 138" to "No. 1,3,8"
21	22	" "RAM" to "ROM"
21	24	" "RAMs" to "ROMs"
21	25	" "25204s." to "two 5204s."
22	2	" "load" to "flow"
22	15	" "The CPU, it stores out away memory" to "The CPU stores it out in memory"
23	1	Change "Nos. 597" to "Nos. 5,9,7"
28	8	" "ordered" to "ORed"
30	27	Delete "visual"
35	23	Change "second" to "section"
39	25	" "porject" to "project"

These changes have been made to the deposition-original by our reporter-notary and the original transcript will be held in our archives pending filing with the clerk of the court.

Yours very truly,

OBUJEN & McCUTCHEON, INC.

Helen S. Preshaw

by: Helen S. Preshaw

HSP:mmi
cc: Jerold B. Schnayer, Esq.
cc: Michael Scherrard, Esq.

IN THE UNITED STATES DISTRICT COURT

FOR THE NORTHERN DISTRICT OF ILLINOIS

EASTERN DIVISION

BALLY MANUFACTURING CORPORATION,

Plaintiff,

-vs-

No. 78C 2246

D. GOTTLIEB & CO., a corporation, and WILLIAMS ELECTRONICS, INC., a corporation, and ROCKWELL INTERNATIONAL CORPORATION, a corporation,

Defendants.

BE IT REMEMBERED that, pursuant to notice and on Thursday, March 6, 1980, commencing at the hour of 2:40 P.M., at the offices of NATIONAL SEMICONDUCTOR, 2900 Semiconductor Drive, Santa Clara, California, before me, WAYNE WALCOFF, a Certified Shorthand Reporter, License No. C 4382, and a Notary Public in and for the County of San Mateo, State of California, personally appeared

KEITH EDWARD WINTER

who was called as a witness by plaintiff.

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I N D E X

Exhibit		Page
GD236	A one-page diagram handwritten by Keith Winter	12

Examination by:

	Mr. Harding	3
	Mr. Schnayer	38

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A P P E A R A N C E S

For plaintiff Barry Manufacturing:

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KEITH EDWARD WINTER

having first been duly sworn by the Notary Public to tell the truth, the whole truth, and nothing but the truth, was thereupon examined and testified as follows:

EXAMINATION BY MR. HARDING

MR. HARDING: Q Would you state your name please?

THE WITNESS: A Keith Edward Winter.

Q Mr. Winter, you have been designated by National Semiconductor to appear on its behalf pursuant to this notice of deposition designated GD235. The deposition pertains to the development by or for United Games, Inc. in Portland, Oregon of an electronic controller for pinball games, including but not limited to the pinball game OXO. Do you understand that you are designee of National Semiconductor on that topic?

A Yes.

Q Were you employed on or around 1975?

A With National?

Q With anybody.

A Yes.

Q With whom?

A National Semiconductor.

Q Are you familiar at all with the electronic controller for pinball games relating to a pinball game called OXO?

A. Yes, I worked on it.

Q. Now, earlier this morning Mr. Sheridan of National produced a collection of documents, which have been marked in an earlier deposition as GD225 through GD228. I'm going to hand them to you and ask if you've ever seen those documents before today?

A. Yes, I have.

Q. What are those documents to your recollection?

A. This is a blueprint of the schematics for the pinball machine that we did for United Games.

Q. Will you please refer to --

A. That's GD225. GD226 is a flow chart of the driver program software that ran the pinball machine. GD227 is a computer printout listing of the software. GD228 is a flyer or handbill or something that the man from United Games brought with him in one of his visits.

Q. Now, do you know in whose files those documents have been kept before they were given to Mr. Sheridan?

A. Yes, they were in my files that I kept in the lab in our department.

Q. Have those documents been under anybody's control from the date they were created until present?

A. How do you mean control?

Q. Under anybody's responsibility.

A. Not really. They are just put away as sort of an archive of projects we had done in the past.

Q. Are they National Semiconductor documents?

A. Yes, they are.

Q Is it part of your responsibility as a National employee to preserve National Semiconductor documents?

A Try to, yes, on projects. It's not a necessity.

Q But were these documents preserved as on your part pursuant to your employment with National?

A Yes.

Q Now, would you please look at Document GD225 and tell me if you recognize the author or authors of those documents?

A I recognize from the handwriting who drew up which sheets.

Q Would you please tell me for Sheet 1?

A Sheet 1 was drawn up by Bernie Kute. Sheet 2 is drawn by Bernie Kute. Sheet 3 was drawn by myself. Sheet 4 looks to be drawn half by myself and half by Bernie Kute. Sheet 5 was drawn by Bernie Kute. Sheet 6 was drawn by Bernie Kute.

Q Referring to Drawing No. 3, Sheet No. 3, which you drew, do you recall approximately when you drew that drawing?

A I can only go by the date that's on it which is the 26th of June, 1975.

Q Do you have any reason to doubt that is not the date that you drew the drawing?

A None whatsoever.

Q Do you have any practices in connection with dating drawings that you complete as to when you affix dates?

A I assign a date to it once I've completed the drawing.

Q Then it would be according to that practice that you finished that drawing on or about June 26th, 1975?

MR. SCHNAYER: Objection, the question is leading.

THE WITNESS: A That would be my practice; I did finish it on the 26th of June, 1975.

MR. HARDING: Q Would you refer to Sheet No. 4? Can you tell me your recollection as to when you finished that drawing, the part of that drawing that you drew?

THE WITNESS: A That would be again 6/26/75.

Q Would you refer now to Drawing GD226. Did you have any role in the preparation of that document?

A Yes. This is all in my handwriting except for this note on the front. As I recall, the man who wrote the program gave me rough copies of the flow chart, which I put into a neater form.

Q Do you recall when you created GD226?

A I can't really give you a date since it's not dated. I would assume it was around the same time.

Q Can you refer to any other documents in the stack to refresh your recollection?

A The computer listing of the program I have dated in my own handwriting, the 16th of July, 1975. I would say the flow chart was done around that time.

Q Do you have any reason to believe that it was not done around that time?

A No.

Q When you created Document GD226, did you have any understanding of the subject matter of that document?

A. A fairly good understanding, yes.

Q. Referring to Document GD227, did you have any role in the preparation of that document?

A. I don't believe so other than the fact that I may have run the assembly process.

Q. Now, you indicated that the date 7/16/75 was in your handwriting?

A. Yes.

Q. Do you recall why you placed that designation on GD227?

A. It's common practice once I run a listing of a computer program that I date it and put the time that it was run for my own reference, to find the most recent copy.

Q. Did you have any role in the development of an electronic controller for the OXO game?

A. Yes, I did.

Q. What was your role generally?

A. My role was to design ~~a~~ one module of the system and also to construct it physically.

Q. What was that module?

A. It was a display module and the chip selecting decoding ~~kit~~.

Q. Do you know, are the display module and chip selecting decoding ~~kit~~ shown in GD225?

A. Yes, they are.

Q. Can you show me where?

A. Sheet 3 of GD225 is the display decoder and driver module. Part of Sheet 4 contains the chip selecting ~~code and~~

logic.

Q Is the remainder of the chip selection and decoding on any other drawing?

A No, it's all on here, Sheet 4.

Q You indicated that your role was also to construct something. Can you explain what you mean by construct?

A To actually put together the breadboard circuits, wire it up.

Q Was there a technician on the job?

A I was acting as technician as well as designing part of it.

Q From your role as technician and part designer, did you acquire any understanding of the overall operation of the controller?

A Yes.

Q Did you become familiar with the construction of the controller such as any displays or any other hardware of the controller?

A I guess I don't understand.

Q Was there any part of the controller that you did not become familiar with?

A No. I have had familiarity with all of the circuits.

Q What is your first recollection of the actions taken towards commencing the design of an electronic controller for the OXO game?

A We were approached by -- I can't remember the man's name -- somebody from United Games, I think it was -- to

design this. He was brought in by one of our field personnel, and I would say it was sometime in May of 1975.

Q. I'm handing you a document that's GD229, and ask you if you have ever seen that document before?

A. Before today, no.

Q. Does that document refresh your recollection as to who approached you from United Games?

MR. SCHNAYER: Objection to the question. He said he's never seen this document.

MR. HARDING: Off the record.

(Off the record discussion.)

THE WITNESS: The name at the top, Frank Johnson, is the man that we talked to here at National.

MR. HARDING: Q. Did you personally talk with him?

THE WITNESS: A. Yes, I did.

Q. Was this prior to any actual development work on behalf of your group?

A. Yes, it was.

Q. Did the development work commence with any hardware or game structure provided by United Games?

A. They provided the box that it was to be housed in along with the play field itself.

Q. Now, can you describe what you mean by play field?

A. The section of the table where the ball rolls across the switches and actually runs the game.

Q. Now, if you would refer to GD228, there is obviously some sort of game apparatus depicted there. Is there any relation between what is depicted there and what was

provided to National during the commencement of this project?

A. Yes, there is.

MR. SCHNAYER: Objection to this question. I don't believe the witness has ever described that he has seen this document before.

MR. HARDING: Q Can you describe in terms of GD228 what was provided to National?

THE WITNESS: A. The base of the game and the play field that you can see under the glass.

Q Would you describe what you mean by base?

A. The white pedestal upon which the game is sitting. The top portion with red outside that has a slanted plastic base with bumper cushions on it, that I would call the play field.

Q The play field is a slanted what?

A. Plastic sheet base.

Q Slanted, you mean sloped?

A. Yes.

Q You indicated earlier this has switches on it?

A. Yes.

Q A ball rolls over the play field?

A. Yes.

Q What kind of ball was it?

A. It was a steel ball, approximately one inch in diameter.

Q Have you ever heard the term pinball?

A. Have I ever heard the term? Yes, I have.

Q Was it a pinball?

A. Yes, I would say it was.

Q. Now, I'll give you a piece of paper. Can you briefly draw, to the best of your recollection, the placement on the play field of these switches that you have referred to?

A. There was one switch in the center of the table, and there were eight switches arranged at the bottom of the table.

Q. Can you designate on that sheet of paper some designation for switches?

A. The only placement I know of was the one in the center, which was No. 2.

Q. Can you draw a circle or something to represent a switch?

A. Right here.

Q. Are there other switches?

A. Yes, they are eight other switches.

Q. Can you show those on your drawing?

A. Yes, they are down here, within a track that fed them into the switch once they came down to the bottom of the play field.

Q. Can you indicate the periphery of the play field in relation to those switches?

A. It's a large play field, something like this.

Q. Was there any other obstacles on the play field, as you recall, that was given to you from United Games?

A. There were rubber bumpers placed around the play field to obstruct the ball's path.

Q. Can you generally designate those?

A. Those would be placed somewhere. I have to go by what's on this piece of evidence here since I can't remember exactly.

MR. SCHNAYER: That was which document?

THE WITNESS: GD228.

MR. HARDING: Q Do you recall whether there was any mechanism for propelling the ball onto the play field?

THE WITNESS: A. There was hand operated plunger.

Q Can you indicate that?

A That would have been down here.

Q Mark that PL or something for plunger.

Was there any mechanism for transferring the pinball after it passed below the row of switches to the plunger?

A Yes. There was a solenoid operated device that kicked the ball to the plunger.

Q Is there any way to indicate that on your drawing?

A Yes, that would be sitting down here somewhere.

Q If you'll mark SOL.

MR. HARDING: Now, would you mark that, please.

(Whereupon, a one-page diagram handwritten by Keith Winter was marked GD236 for identification.)

MR. HARDING: Q Do you recall approximately when this play field structure was provided to National?

THE WITNESS: A Well, I would say somewhere between the beginning and middle of June, 1975.

MR. SCHNAYER: Objection to the question, lack of foundation as to whether this witness would have firsthand

knowledge of that.

MR. HARDING: Q When was the first time that you recall seeing the play field?

THE WITNESS: A. When it was delivered.

Q. Beginning to mid-June?

A. Yes.

Q. Who were any other individuals who had a role in developing the controller?

A. Bernie Kute, Milt Schwartz, and Al Weisberger.

Q. Now, I hand you a document, GD234, and ask you whether you've ever seen that document before?

A. Yes, I have.

Q. What is it?

A. It's a schematic drawing of a PACE application CPU card.

Q. Have you ever had occasion to use the PACE application CPU card?

A. A few times, yes.

Q. When was the first time that you recall using it?

A. I would say with this pinball machine was the first time we used the card.

Q. That would be the OXO pinball machine?

A. Yes.

Q. Can you describe what you mean by a PACE application CPU card?

A. Okay. It is a central processing unit computer board based on the ~~pace of~~ PACE 16 bit microprocessor intended for customer's end applications.

Q Is it a general purpose type card?

A Yes, it is.

MR. SCHNAYER: The question is leading.

MR. HARDING: Q Did you have any understanding of any special purposes which this card was designed for?

THE WITNESS: A No, no special purpose.

Q What was your understanding?

A It is a general CPU board. It can be used in many different ways.

Q Now, you indicated you used the PACE CPU card in connection with the OXO controller.

A Yes.

Q Can you now refer to GD225 and relate the structure depicted therein to the PACE CPU card?

MR. SCHNAYER: Objection to the question, lacking foundation as to whether this relates.

THE WITNESS: A The CPU puts out addresses and data.

MR. HARDING: Q Indicating the PACE CPU?

THE WITNESS: A The PACE CPU card on its edge connector, and that plugged into the card, that supported the controller circuitry for the pinball machine. Those signals directly drove the circuitry that was on there.

Q Now, did the controller involve memory?

A Yes, it did.

Q Can you identify any memory which was utilized in the OXO controller by referring to GD225?

MR. SCHNAYER: Objection to the question, lacking

foundation.

THE WITNESS: A. On Sheet 1 of GD225, it shows the RAM and ROM portions of the memory.

MR. HARDING; Q. You did tell me you were familiar with the actual electronic circuitry of the controller; is that correct?

THE WITNESS: A. Yes.

Q. And you prepared at least Sheet 1 of the drawings, so you are familiar with that?

A. No, I didn't prepare Sheet 1.

Q. Are you familiar with the circuitry depicted in Sheet 1?

A. Yes.

Q. How did you become familiar with it?

A. Through my education and use on this job.

Q. What role did memory play in the OXO controller?

A. The ROMs contained the driver software, and the RAMs were used for temporary storage.

Q. Now, what do you mean by ROM?

A. The read only memory.

Q. Is that shown on GD225?

A. Yes, it's on Sheet 1. The package location is 1N and 2N.

Q. You are pointing to the rectangle designated 5204; is that correct?

A. Yes.

Q. You referred to RAM. To what does that refer?

A. That refers to these four.

Q Can you designate --

A They are 2101 RAMs, package designation 1R, 2R, 4K and 5R.

Q You said the ROM contained driver software?

A Yes.

Q What driver are you referring to?

A The program that allowed PACE to operate the pinball machine.

Q Now, referring to GD236 and the row of switches, do you know whether those switches are designated in GD225?

MR. SCHNAYER: Objection to the question, lack of foundation.

THE WITNESS: A They are shown, eight of them are shown on Sheet 4 of GD225.

MR. HARDING: Q Do you know whether any other switches are shown?

THE WITNESS: A One of them is on Sheet 2 of GD225.

Q Which one is on Sheet 2?

A ~~Sheet~~ Switch No. 2.

MR. SCHNAYER: Continuing the objection, lack of foundation.

MR. HARDING: Q Did you ever have an understanding during this development of the game objective of OXO?

THE WITNESS: A As it was spelled out to us by Mr. Johnson, yes.

Q What was your understanding of the game objective?

A My understanding was that it was a game of chance,

and that various results of playing the game paid off I assume in money.

Q What was the game play, if you know?

A It was loosely based on tic-tac-toe.

Q Can you be more specific?

A All right. There are various ways of lighting up lights in a tic-tac-toe board which paid off different at different odds.

Q What tic-tac-toe board are you referring to?

A The display section of the board that's shown in here.

MR. SCHNAYER: You are referring to the document --

THE WITNESS: GD228. There is a three by three matrix shown on the display board.

MR. HARDING: Q Did United Games actually give you the three by three matrix display board?

THE WITNESS: A No, they did not.

Q Did you ever have a display board at National?

A We built one.

Q What did you use?

A Used standard incandescent light bulbs in a three by three matrix.

Q Is there any relationship between the row of switches you have shown in GD236 and the operation of the incandescent bulbs in the three by three matrix?

MR. SCHNAYER: Objection to the question.

THE WITNESS: A Yes, they are directly related.

MR. HARDING: Q Can you explain that relation?

THE WITNESS: A. When the ball rolled across the switch, a corresponding light on the display turned on.

Q. How was that effected in the controller?

A. I don't understand that.

Q. Well, I understand how a ball activates the switch. How did the controller, then, turn on the light?

A. The CPU senses that a switch had been closed, determined which switch it was, and lit the correspondingly numbered light on the display field.

Q. How did a CPU sense the switch that was closed?

A. Any switch closure on the play field caused an interrupt to the CPU, and it then read the switches, and found out which one had closed, and determined which light to light from there.

Q. Can you refer to GD225 and explain in a little more detail how this interrupt was generated?

MR. SCHNAYER: Objection to the question, lacks foundation.

THE WITNESS: A. On Sheet 4 of GD225 the switch matrix is shown.

MR. HARDING: Q. Can you identify the switch matrix?

THE WITNESS: A. It's in the center of the paper and it's labeled, "Switch Matrix."

Q. Do you recognize the handwriting of the person who put "Switch Matrix" on the drawing?

A. I would say that the switch matrix itself has my handwriting on it; some of the control circuitry has Bernie

Kute's handwriting.

Q Well, the term switch matrix itself.

A That has my handwriting on it, yes.

Q Do you recall why you wrote switch matrix, why you called that a switch matrix?

A For clarity, and because it's in a two by four matrix.

Q Can you explain, then, how the CPU sensed closure in terms of this switch matrix?

MR. SCHNAYER: Objection to the question.

MR. HARDING: Q Mr. Winter, you did say you were familiar with the software and hardware by virtue of your being a technician and constructing the game and debugging it; is that correct?

THE WITNESS: A Yes.

Q Please proceed.

A The CPU set the logic in the controller to sense any switch closure by when a switch closed, an active load signal was applied to the CPU interrupting No. 3.

Q How was that generated through chip selecting decoding?

A No. 174 and CPU ~~174CPU~~ would leave that in a state that would sense any switch closure, no matter what the CPU was doing at the time.

Q How would that happen?

A Through an interrupt, a closure would drive the interrupt load.

Q Can you explain how that occurred?

A. Package 3L, two parts of T, and 4M would cause a logic zero to be sitting on the common connections of the switch matrix which are then ~~handed~~ ANDed together to produce an interrupt on any switch closure.

Q. What common connections of the switch matrix are you referring to?

A. I have to say 10 and 11, signal No. 10 and 11 coming out of the matrix, which would be wires on the play field, which are tied together through the logic to produce the interrupt.

Q. Can you describe how the switches in each of the sets in the matrix are interconnected?

A. Switch Nos. 5, 7 and 6 are connected together. Switch No. 1, 8 and 4 are connected together. Wait a minute -- yes, that's correct.

Q. Is that one end of the switch?

A. Those are one end of the switch, normally open contact.

Q. What about the other end of the switch?

A. The other end of the switches are tied through an AND gate, package No. 6H, to produce an interrupt to the CPU.

Q. Upon closure of one of the switches, what happens?

A. Any time a switch is closed, an interrupt will be produced to the CPU.

Q. Does that interrupt have a designation?

A. Yes, it's interrupt Level 3, NIR3.

Q. That's on Sheet 4?

A. Yes.

Q What happens to NIR3 as shown on Sheet 4?

A. That is connected onto the PACE CPU application card.

Q How is that connected to the PACE card?

A. Through the edge connector on the card where it plugged into the controller circuit.

Q Referring to GD234, can you indicate that connection?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A. The connection is not given a jumper number. It's on the right side of the print, labeled BD0 through BD15. And also NIR3 on the left side of the print, No. 30.

MR. HARDING: Q When you say BD0 through 15, are you referring to the interrupt according to both locations?

THE WITNESS: A. No, I'm sorry, that was on No. 30 of the edge connector.

Q Designated?

A. NIR3.

Q What does the CPU do once it gets a NIR3 interrupt request?

A. When it sees the interrupt, it will branch to a service routine that is in ~~RAM.~~ ROM

Q Are you referring to --

A. The ~~RAMs~~ ROM that are on the card that we discussed earlier, package No. 1N and 2N, the ~~25204s.~~ two 5204s.

Q Then what happens?

A. At that point it executes the program that services Level 3. In this case, it reads the switch matrix to

determine which switch was closed.

Q Now, can you refer to the ~~load~~ flow diagram which you said you generated, and refer additionally to Sheet 4, and describe how this reading takes place?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A. These pages aren't numbered. Page 5 of GD226 is a flow chart of the routine executed by the CPU to determine which switch was closed.

MR. HARDING: Q Now, can you describe how that routine effects operation of the switch matrix?

THE WITNESS: A. Okay. It first reads the Scan A location, which reads half of the switch matrix.

Q You say it reads?

A. The CPU, ~~it~~ stores it out ~~away~~ in memory.

Q How does a CPU read the switch information?

A. It executes a read instruction from that address location.

Q What does that read instruction cause to happen?

A. It causes to read which switches are closed in the switch matrix.

Q How does it do that?

A. It produces an address, which corresponds to the Scan A followed by a read strobe which gates the data into the CPU from that address location.

Q Referring to Sheet 4, upon generation of Scan A, can you tell me what happens to the switch matrix?

A. Scan A going low activates Package 3L, one quarter

of 3L, which reads switches Nos. 597 and 6, turning them on, and gating them through these buffers 6J onto the CPU's data bus.

Q Does a switch have to be closed before any signals --

A No, the CPU will normally read Logic 1 unless a switch is closed, at which point it will read Logic 0.

Q Now, you indicated switch data was stored in memory.

A Yes.

Q Can you explain that?

A When it reads it in, it comes into an internal register, which it then stores away into a memory location for later use.

Q Where is that memory location?

A Somewhere in the RAM.

Q Which RAM?

A The RAM that's on the controller board, packages Nos. 1R, 2R, 4K and 5R.

Q Is that RAM memory location related to the particular switches on the play field?

A That location is just an arbitrarily assigned location in RAM for temporary storage.

Q Does the CPU know from the particular content of that storage location which switches, if any, however were activated?

A Yes.

Q After Scan A has occurred, what then occurs, if anything?

A Then it runs Scan B, an identical operation, except

that it reads switches Nos. 1, 3, 6 and 4, and stores in memory also.

Q That's in RAM?

A Yes.

Q So at that point, is there a set of memory locations which characterizes all eight switch states?

A Yes.

Q Then does anything further happen?

A Then it goes through a software delay to allow for switch bounce, followed by an identical operation of scanning the switches.

Q Identical to what?

A To the previous scan operation; storing the data in a different location in RAM.

Q What do you mean by switch bounce?

A Mechanical switches, when they close, tend to bounce, giving you multiple closures. In order to accurately read the switches, you must wait until the bouncing stops and you have a good definite switch closure.

Q To your experience, was that a common occurrence in 1975 with switches?

A That always happens with switches.

Q Do you know whose idea it was to put in a software delay and follow up with a second set of scans?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A For this particular application?

MR. HARDING: Q Yes.

THE WITNESS: A. It was Al Weisberger.

Q. How do you know that?

A. The fact that he wrote the program and had seen the program.

Q. After the software delay and the second scan was implemented in the controller, did you ever personally observe any problems associated with switch bounce in the OXO game?

A. No.

Q. Now, if you would refer to GD236, I would like you to describe a three ball game play sequence, relating the operation of the CPU through the lamps, to the scoring display, and to the operation of the switch matrix, including the Scan A Scan B sequence.

MR. SCHNAYER: Objection to the question, lacking foundation.

MR. HARDING: Q. How many balls were in this program to account for?

THE WITNESS: A. I believe it was three.

Q. Did you ever play the game?

A. When we were testing it, yes.

Q. Will you please describe the sequence.

A. When the game was begun, by pressing the play switch.

Q. What play switch are you referring to?

A. That's on the front of the cabinet labeled here, the yellow switch.

Q. You are referring to GD228?

A. Yes. It's a yellow push button, which activated the game. After that, the CPU through the ball kicker

solenoid, slid a ball to the plunger, which operator would then pull back and shoot the ball into the play field, and the ball would then roll down across the play field, and sooner or later pass over a switch or possibly two, depending if it came through No. 2 switch; at which time the CPU would sense a switch closure through the interrupt Level 3, scan the switch matrix using Scan A and Scan B lines, and determine which switch was closed. It would then light the corresponding light on the three by three matrix.

Q What is it?

A The CPU, and the ball would then come down into the ball kicker, and it would then kick the ball out again to become ball No. 2. Operation of the plunger would then put the ball back on the play surface to come down through another switch or possibly the same switch. The CPU would again scan the switch matrix as before, lighting the appropriate lights. The ball would be kicked back and the third ball would be the last operation, which the player would then shoot the ball onto the play surface. The CPU would sense the switch closure, and scan the matrix to find out which one it was, and illuminate the appropriate light on the play field, at which point the game would be over.

Q So, for every ball that was shot onto the play field, there would be a sequence of Scan A Scan B, Scan A Scan B applied to the switch matrix; is that correct?

A That's correct.

MR. SCHNAYER: Objection to the question as leading.

MR. HARDING: Q This sequence would repeat for the

second ball and once again for the third ball?

THE WITNESS: A. That's correct.

MR. SCHNAYER: Objection to the question, leading.

MR. HARDING: Q. Tell me what repitition would there be if there would be any repitition between the Scan A Scan B, Scan A Scan B sequence of the first ball and such a sequence for a second ball, and such a sequence for a third ball?

THE WITNESS: A. If I understand you correctly, the operation is identical each time a ball closes a switch.

Q. So it's repeated?

A. Repeated, yes.

Q. Have you ever heard the term cycle applied to scanning the switch matrix?

A. No.

Q. After the Scan A data had been run into its RAM location and Scan B data had been run into its RAM memory location, then you performed the second Scan A and Scan B, what would happen to that data?

A. If you performed the pair a second time?

Q. Yes.

A. The earlier data would be lost.

Q. I'm referring now to the Scan A Scan B, Scan A Scan B sequence for bounce.

A. Yes.

Q. Scan A was read into memory. Scan B was read into memory. Then you perform a second Scan A?

A. Yes.

Q What happens to that data?

A. That goes into another memory RAM location.

Q What happens to the second B?

A. The same thing.

Q So you have four RAM locations of data?

A. Yes.

Q Then what happens?

A. Those are ~~ordered~~ ORed together logically within the computer to determine if it was an actual switch closure or if it was simply noise that somehow got into the system. If it was, it would exit the routine and wait for another interrupt. If the data was the same for both in each Scan A and Scan B, then the CPU would test to find out which switch was closed, and light the corresponding lights on the display field.

Q Did there ever come a time in your mind when you considered the development completed?

A. For our part, it was completed when Mr. Johnson drove down here from Portland, picked up the machine, and took it back.

Q Do you recall approximately the date that that happened?

A. I can only say it was after the latest date on the software, which was the 16th of July, '75.

Q Relatively speaking, was it shortly thereafter?

A. It was shortly thereafter.

MR. SCHNAYER: Objection, lack of foundation.

MR. HARDING: Q What do you base your recollection

on that it would be shortly after that date?

THE WITNESS: A. Simply that I remember that the machine was not around. We did not keep it around very long after we completed the project.

Q. Now, you indicated that you had played the game during the development project. Did you form any conclusions as to how satisfactorily the game played?

A. It was performing satisfactorily as per the requirements. It met his requirements.

Q. Mr. Johnson came down to pick up the game. Do you recall him performing any tests on the game?

A. I believe he played it a couple of times to verify that it worked properly.

Q. How did you know that this was the reason that he was playing the game?

A. That's an assumption on my part.

Q. Did he then accept the game and take it away from National?

A. Yes, he did.

MR. SCHNAYER: Objection to the question, lack of foundation.

MR. HARDING: Q. How to know Mr. Johnson took the game away from National?

THE WITNESS: A. Because I helped him carry it to his car.

Q. Have you ever heard of the term multiplexing?

A. Yes, I have.

Q. By 1975, had you heard of the term multiplexing?

A. Yes, I had.

Q. By 1975, on this project, had you formulated an opinion of the meaning of the term multiplexing?

A. Yes, I had.

Q. What was your opinion?

A. What my opinion was is if you are talking about displays, it was a matter of time, slicing the display information up so that you went through one digit followed by the next until you finished all the digits, coming back to start all over again. It's a matter of putting information on the data bus to be read in by the CPU, different pieces of the information at different times where it's assembled internally.

Q. The signals representative of the switch states produced in response to Scan and Scan B, were they communicated to the PACE CPU via the data bus you just referred to?

A. Yes, they were.

Q. Did you ever form an opinion in 1975 whether those signals were multiplexed on the data bus?

A. Yes, they were.

Q. Did you ever form an opinion as to whether or not these switch signals were time multiplexed in sequence on the data bus when they were being returned to the PACE CPU?

A. Yes, they were.

Q. Did this sequence repeat for the second and third ball of every game?

A. Yes, it did.

Q. Was the PACE CPU a visual processor?

A. Yes, it is.

Q Are you familiar with the particular switches which were referred to in GD236?

A How do you mean familiar?

Q Did you ever observe the structure and operation of the switches?

A Well, it was a microswitch with a long activating arm on it.

Q When the pinball would engage a switch, what would be the operation?

A When the ball came down across the switch, it would press the arm down making a switch closure. Once the ball was off the arm, the switch would then open.

Q The ball contacted the arm?

A Yes.

Q The arm was connected to the switch?

A Yes.

Q The switch is what is shown on Sheet 4 as being scanned by the PACE CPU?

A Yes.

MR. SCHNAYER: Objection to the question as leading.

MR. HARDING: Q Do you recall observing anyone else playing the OXO game prior to Mr. Johnson taking it from National?

THE WITNESS: A I believe Bernie Kute played it a few times. Several of the technicians in the lab played with it. I think that's all.

Q Do you recall the general time period it took for the controller to be developed from when you first received

the game structure from Mr. Johnson, approximately?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A. Approximately four to six weeks.

MR. HARDING: Q. Do you recall the time period between the occurrence of a Scan A signal and the occurrence of the next Scan B signal?

THE WITNESS: A. Well, it would have been a matter of two or three instructions executed by the CPU, which I would say would be between 20 and 25 microseconds.

Q. How do you know that?

A. By the fact that the read operation would take some amount of time, followed by a store operation into memory, followed by the next read operation, Scan A and a store, Scan B and a store.

Q. Do you know whether or not this time interval was constant for the second scan sequence?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A. It would be the same.

MR. HARDING: Q. Do you know the time interval between the first sequence of Scan A Scan B signals and the second sequence of Scan A Scan B signals?

MR. SCHNAYER: Objection to the question.

THE WITNESS: A. No, I don't know the exact amount of time.

MR. HARDING: Q. Do you know approximately? Would the flow chart or the other listing help you refresh your

recollection?

THE WITNESS: A. Yes, I could probably look at it and figure it out.

MR. SCHNAYER: For the record, I believe the witness is examining GD226, and I will request that he make it clear.

THE WITNESS: GD226, Page 5 again and GD227, Page 3, delay constant -- no, I take that back.

MR. SCHNAYER: I would request that he be asked what portions of the exhibit he's looking at.

THE WITNESS: I'm looking at Level 3, interrupt service routine of GD227, source code lines 359 and between 359 and 380. It would be approximately five milliseconds delay between the first and second operations of Scan A and Scan B.

MR. HARDING: Q. Would that delay be the same or different from the delay during the second ball?

THE WITNESS: A. No, it would be the same.

Q. How about the third ball?

A. The same, the program executes the same service routine for each interrupt.

Q. Now, you talked about the ball kicker solenoid.

A. Yes.

Q. To what extent, if any, did the PACE CPU control operation of that solenoid?

A. The CPU used one of its hardware flag outputs through interface circuitry to energize the solenoid by doing a set flag instruction.

Q. Will you refer to Document 225 and explain that operation in terms of hardware?

MR. SCHNAYER: Objection to the question, lacking foundation.

THE WITNESS: A. Okay. On Page 6 of 225 the interface circuitry between the flag output from the CPU and the ball kicker solenoid is shown.

MR. HARDING: Q. What are you referring to, which circuit?

THE WITNESS: A. It's the lower circuit of the three high voltage interface circuits shown on this page.

Q. Where is the signal generated from that eventually arrives at the circuit you are referring to?

A. The flag that is produced by the CPU comes onto the card from these designations through an optoisolator and through another amplifier, two other amplifiers, to control a 28 volt solenoid.

Q. Can you refer to another drawing and indicate the flag that you are referring to?

A. GD234, the flag is shown coming out on -- I'm not sure which flag it is here; either in 22, 21 or 24.

Q. Is there any way you can tell?

A. Yes, I can find out which flag is used.

MR. SCHNAYER: You are again referring to the software, GD227?

THE WITNESS: Yes.

MR. SCHNAYER: Again, Mr. Harding, I request that you ask him to testify as to what lines he's looking at to make that determination.

THE WITNESS: From the software listing, Flag 14 from

the CPU was used to activate the ball kicker solenoid. Buffer Flag 14 comes out on Pin 23 shown on GD234.

MR. HARDING: Q To your recollection, did the ball kicker solenoid have to be maintained energized for any given period of time?

THE WITNESS: A. Yes, there was a certain amount of time to make sure that it kicked the ball all the way out before it was turned off.

Q. Do you recall how that -- how that time period was guaranteed?

A. It was through a software delay.

Q. Can you explain that?

A. The CPU would set the flag, do a delay, and then clear the flag. When the flag is clear, the solenoid would be deenergized.

Q. Do you recall approximately the amount of time of that delay?

A. I would have to figure it out again. Referring to GD227, approximately 20 milliseconds.

MR. SCHNAYER: Mr. Harding, I request that you ask the witness to testify to the portions of the software, which lines.

THE WITNESS: All right. GD227, the ~~second~~ Section of the code that activates the ball kicker is between source Lines 153 and 157.

MR. SCHNAYER: Thank you.

MR. HARDING: Q Can you just briefly relate the interconnection of the data bus from the CPU card to the

memory that you testified to and to how the data bus on the CPU card produced signals to initiate scanning of the switch matrix and to receive scan signals in return?

MR. SCHNAYER: Objection to the question, lack of foundation.

THE WITNESS: A. Referring to GD225, Sheet No. 1, the data bus is connected from the CPU card.

MR. HARDING: Q. Where is that connection on the CPU card?

THE WITNESS: A. That is on GD234, the connection shown on the right side of the drawing, BD0 through BD15, which are connected to the controllers shown on Sheet 1 of GD225 also indicated BD, in this case BDI0 through BDI15. Connected from here to here.

Q. Go ahead.

A. The data bus from the CPU card is connected indirectly to the memory.

Q. By what terminals?

A. By the same terminals that came from the CPU card. BDI0 through BDI15 comes directly into the memory, and would also come into the address latches shown on GD225, Sheet 4.

Q. What connections, if any, are made to the A0 through A7 inputs on the RAM circuits?

A. They are connected from the address latches shown on Sheet 4 of GD225.

Q. Do you know which AD signals are applied to the A0 through A7 address terminals on the 2101 RAM?

A. Yes, AD0 is applied to A0. AD1 is applied to A1,

et cetera.

MR. SCHNAYER: What page is that?

THE WITNESS: GD225, Sheet 1 and Sheet 4 show the connections.

MR. HARDING: Q What are the connections to the ROMs 5204?

THE WITNESS: A. A0 through A8 on the ROMs are connected to AD0 through AD8 from the address latches shown on Sheets 1 and 6 of GD225 -- 1 and 4, I'm sorry.

Q How is the switch matrix scanned?

A. The switch matrix, the CPU applies an address to the controller card. The addresses are latched by the address latches shown on Sheet 4.

Q Designated what?

A. On GD225, the package designations are different. They are 74174s and 74175s. The addresses are latched and applied to the 74154 address decoder. If trying to scan Scan A, it will produce an output on Pin 1, which is applied through the logic of the switch matrix to perform the Scan A read operation. That data, when the read strobe is applied, comes out on BD0 through BD2 and BD15.

Q What happens?

A. That data is then accepted by the CPU in an internal register.

Q How does it accept the data, on what terminals?

A. It's accepted on BD0 through BD15 of the edge connector.

Q Now, if you would look at each page individually of

GD225, and tell me from your understanding of the actual hardware implementation of the controller for OXO whether that respective page of GD225 accurately describes that portion of the controller, and if it doesn't, then tell me how it differs to your recollection?

MR. SCHNAYER: That's according to his understanding, counsel; is that correct?

THE WITNESS: A. To the best of my recollection, the print in GD225 accurately reflects the system as we gave it to Frank Johnson.

MR. HARDING: I have no further questions.

MR. SCHNAYER: Let's take a break.

(Whereupon, a short recess was taken.)

EXAMINATION BY MR. SCHNAYER

MR. SCHNAYER: Q I show you a copy of the document which has been marked in this litigation GD236. Do you recognize that to be the document that you've just drawn?

THE WITNESS: A. Yes, it is.

Q When a ball is ejected onto the play field that's represented by this document of the OXO game, in order to exit the play field, does the ball have to go over one of the eight switches?

A. Yes, it has to go over.

Q So this drawing is really not correct?

A. That's not correct. It does have to cross at least one switch.

Q To your understanding, were any products of National Semiconductor ever sold to United Games for use in

pinball machines manufactured by United Games?

A. I would have no way of knowing.

Q. Did you ever hear anybody talk about that?

A. I don't recall, because I don't get involved in the marketing aspects.

Q. Did you ever see an OXO game produced by United Games which contained a controller, which you had been involved with?

A. No, I never saw it.

Q. Did you ever hear anybody discuss the fact that they had seen a controller?

A. No.

Q. That's of course besides the one that you helped design.

A. Yes.

Q. Prior to your participation in designing the controller for the OXO pinball game, were you aware of the existence of any solid state pinball machine?

A. Before that, no.

Q. Prior to the completion of the project, were you aware of the existence of any other pinball machines?

A. No.

Q. Were you aware of work by other people who were working on a solid state pinball machine prior to the completion of your ~~porject~~ project?

A. Not that I ever heard of, no.

Q. What was your experience with the pinball machines prior to your working on the OXO project?

A. My only experience was as a consumer, playing the machines.

Q. Did you ever take one apart?

A. No.

Q. You never saw the inside of one?

A. No, not before I saw this one.

Q. To your understanding, were there any other employees that worked for United Games besides Mr. Johnson?

A. He's the only one I met. He had an assistant with him when he came down. I think it was his secretary or something, when he picked the machine up.

Q. Do you know if it was a she?

A. Yes.

Q. Do you know her name?

A. No, I can't remember the name.

Q. Have you ever been out to United Games?

A. No.

Q. Do you know anything about the company?

A. No, other than the machine we designed for them.

Q. Do you know whether the company is in existence today?

A. No. That was the last I heard of it.

Q. After the game was delivered to Mr. Johnson, did you ever talk to him about the game?

A. No.

Q. Did you ever discuss the fact of whether he had called back and discussed the game with anybody?

A. Not to my recollection, no.

Q Do you have any understanding of what a stand alone game is?

A. I've never heard the term.

Q Referring to the schematics, GD225, six pages of schematics, I believe you testified previously that there were some optoisolators used in the circuits.

A. Yes, that's correct.

Q Could you point out to me where those optoisolators are contained, and tell me the page number, and tell me which type of devices are they used with.

A. Okay. GD225, Sheet 2, there was one optoisolator shown on the upper left corner. The part number is not listed. I'm pretty sure it was a NCT200 manufactured by National.

Q What was that used for?

A. That was used for a power fail detect. Also on Page 5 of GD225 there are optoisolators shown between the CPU and the incandescent lamps again indicated as NCT200s. Also Sheet 6, GD225, there are three more optoisolators shown, NCT200s, between the CPU and the solenoids.

Q That's all of the optoisolators?

A. Yes.

Q Do you know what the purpose of using the opto-isolators was?

A. Mainly to isolate the CPU from the noise generated by that high voltage circuitry. The solenoids tend to make a lot of noise when they are activated, which could cause trouble to the CPU.

Q Do you know how it was determined that these parts

should be used in the design, the optoisolators?

A. They are used because they were the only optoisolators that National used at the time, and they wanted to use proprietary products.

Q. Why was an optoisolator used?

A. To eliminate the noise generated by the solenoid.

Q. Did somebody make a determination that there would be noise that would be present, and that these would correct the problem?

A. I believe Milt Schwartz did, since he had worked with that type of circuitry before.

Q. How did you know that Milt Schwartz made that determination? What do you base that answer on?

A. I remember him saying so.

MR. SCHNAYER: That concludes my cross-examination of the witness. Thank you.

Keith Edward Winter

Keith Edward Winter

Subscribed and sworn to before me this 7TH day of APRIL, 1980.

Sandra R. Miller

Notary Public in and for the County of SANTA CLARA, State of CALIFORNIA.

OFFICIAL SEAL
SANDRA R. MILLER
NOTARY PUBLIC — CALIFORNIA
PRINCIPAL OFFICE IN THE
COUNTY OF SANTA CLARA
My Commission Expires October 18, 1980